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EXAMINER

LEUNG, QUYEN PHAN

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/934,930

Applicant(s)

MITOMO ET AL.

Examiner

Quyen P. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "a distance between said resonator end surfaces of said light guide and said step-like structure become greater than a distance between said portion of said light guide not including said resonator end surfaces and said step-like structure" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites in the last paragraph "a distance between said resonator end surfaces of said light guide and said step-like structure become greater than a distance between said portion of said light guide not

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including said resonator end surfaces and said step-like structure". It is unclear where there is support in the specification for the resonator end surfaces and the step-like structure having a distance. Claims 2-18 are rejected for the same reason.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 1 recites "an active layer" in line 3 and also line 7. It is unclear whether this is one in the same layer that is referred to in the claim. Claims 2-18 are rejected for the same reason.

7. Claim 1 recites in the last paragraph "a distance between said resonator end surfaces of said light guide and said step-like structure become greater than a distance between said portion of said light guide not including said resonator end surfaces and said step-like structure". It is unclear how the resonator end surfaces and the step-like structure can have a distance, when they are perpendicular to one another. Claims 2-18 are rejected for the same reason.

### ***Claim Rejections - 35 USC § 102***

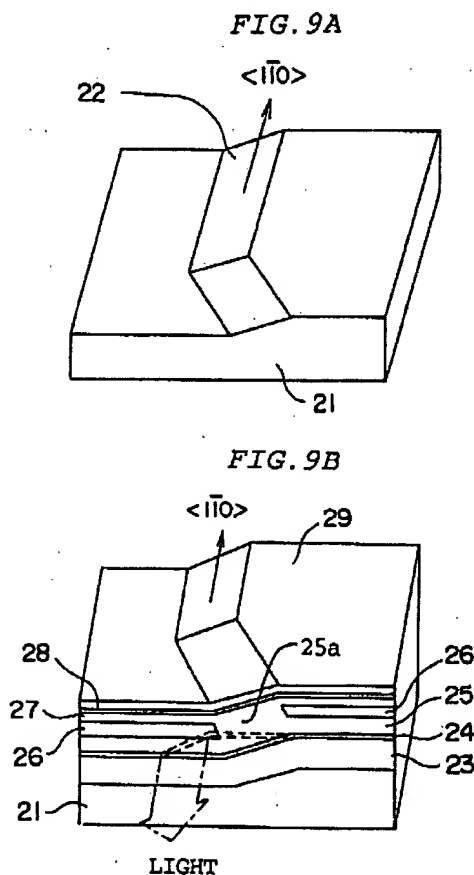
6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-18, to the extent understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Furuya (5,568,500). Furuya discloses the claimed invention. Note figures 9A and 9B comprising a substrate (21), a semiconductor stack (23-29), at least one step-like structure (22).



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(Fourth embodiment)

FIGS. 9A and 9B are perspective sectional views of the device showing the fourth embodiment of the present invention.

In FIG. 9A, the top of an n-GaAs substrate 21 has a plane tilted by  $6^\circ$  off toward the  $\langle 110 \rangle$  direction from the (001) plane, that is, a plane being by  $6^\circ$  off toward  $\langle 110 \rangle$ . And, a terrace having a mesa-shaped slope 22 with an inclination of approximately  $20^\circ$  is formed on the plane. The slope 22 extends in the  $\langle 110 \rangle$  direction which is the waveguide direction in the central region of the substrate and has a striped shape bent by approximately  $30^\circ$  from the  $\langle 110 \rangle$  direction at the vicinity of the light output edge.

Thereby, both the top of the n-GaAs substrate 21 and the slope 22 become the so-called A-plane.

As shown in FIG. 9B, an n-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP cladding layer 23, an InGaP active layer 24, and a p-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP cladding layer 25 are formed up to the thicknesses of 1, 0.03, and 2  $\mu\text{m}$  respectively according to film deposition by MOVPE on the substrate with the slope 22 formed on it.

Moreover, an n-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP layer 26 is formed on the p-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP cladding layer 25 in the region along the both sides of the slope 22. And a p-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP layer 27 is formed on the cladding layer 25 above the slope 22, and a p-AlGaInP layer 27 is formed on the layers.

An n-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP layer 26 is formed by the following method.

By doping III-V-group compound semiconductor with II- and VI-group elements at the same time for deposition of the semiconductor by MOVPE, more VI-group elements are incorporated if the angle of the A-plane is as small as approximately  $6^\circ$  but II-group elements are more easily incorporated if the angle increases to several tens of degrees as shown in FIG. 10. Therefore, by properly adjusting the doping quantities of Zn and Se and doping a film with Zn and Se at the same time to form the film, a p-type layer is formed on the slope 22 with a large off angle and an n-type layer is formed on other flat region. The n-(Al<sub>0.7</sub>Ga<sub>0.3</sub>)InP layer 26 is formed by the above method.

Thus, a pnp-junction current constriction structure is formed on the both sides of the slope 22 and the active layer 24 in the striped region along the slope held by the current constriction structure serves as a pumped region.

Then, a p-GaAs contact layer 29 is formed on the p-AlGaInP layer 27 through a p-InGaP layer 28. In this case, the p-InGaP layer 28 is formed to change the difference between energy band edges of heterostructure by steps.

Though not illustrated, a low-reflection film is formed on the plane at the light output edge side, a high-reflection film is formed at the side opposite to the edge side, and moreover a p-electrode is formed on the contact layer 29 and an n-electrode is formed on the bottom of the GaAs substrate 21.

For the semiconductor laser with the above structure, the striped active layer 24 on the slope 22 serves as a pumped. However, because the active layer 24 is bent transversely in the vicinity of the output edge, not the active layer 24 but the (AlGaInP) layers 24, 25, and 26 at the side of the layer 24 serve as light output edges.

As a result, the energy band gap of a light output edge gets larger than the photon energy of a laser beam, light absorption at the light output edge is suppressed, and the laser output level causing a COD breakdown increases.


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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quyen P. Leung whose telephone number is (703) 308-0545. The examiner can normally be reached on 8:30-5:00, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Ip can be reached on (703) 308-3098. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Quyen P. Leung  
Primary Examiner  
Art Unit 2828

QPL